

Technical Memorandum

To:	Roger Ling, Ling, Robinson and Walker
From:	John Koreny
CC:	Dan Temple, A&B ID
Date:	September 30, 2004
	Project: A&B Irrigation District
	Job No: 6925

RE: Interim Groundwater Evaluation Report for A&B Irrigation District

INTRODUCTION

This memorandum describes groundwater data compilation and analysis for the A&B Irrigation District (A&B). Data was compiled from A&B files, the Bureau of Reclamation (BOR), Idaho Department of Water Resources (IDWR) and other sources. Information was also compiled from previous reports prepared for A&B (HDR, 1998).

A&B GROUNDWATER SUPPLY

A&B owns and operates approximately 180 wells with production capacities ranging from approximately 800 to 4,500 gallons per minute (gpm). The wells are completed in the upper portion of the Snake River Group Basalt Formation which forms the Eastern Snake River Plain Aquifer (ESRPA) (Crosthwaite and Scott, 1956). The locations of the wells are shown on Figure 1, and the well specifications are summarized on Table 1. The average capacity of all production wells is approximately 2,000 gpm. The wells range from 100 to 1,000 feet in depth and the average well depth is approximately 330 feet. Most of the A&B wells were initially drilled during the later 1950s and early 1960s by the Bureau of Reclamation as part of the Minidoka Project. Approximately half of the wells were deepened during the early 1960s to accommodate drawdown occurring during the initial development of the Project. Since the first round of well deepening in the early-1960s, A&B has been required to periodically deepen wells on numerous occasions to avoid dewatering of pump intakes in response to regional declining water levels.

GROUNDWATER HYDROLOGY

Groundwater elevation contour and flow maps were developed from spring static (non-pumping) groundwater measurements collected in 1960, 1980 and 2003, as shown on

Figures 2, 3 and 4, respectively. Groundwater flows from the east to the west following the regional groundwater gradient reported in numerous regional studies (Schmidt and Miller, 2003; Lindholm, 1996; Garabedian, 1992; Crosthwaite and Scott, 1956). The ground water gradient also roughly correlates with the hydraulic gradient between Walcott Dam to the east of the Project and Milner Dam to the west. Groundwater flow direction is consistently from the east to the west and southwest. A hydrogeologic cross-section is presented on Figure 5 indicating the relative difference in elevation between ground water elevation and the well depths.

Hydrographs were developed showing both spring static (non-pumping) and summer drawdown (pumping) ground water elevations recorded in 14 production wells. The hydrographs were divided into three groups to describe historic groundwater conditions occurring in the east, center and west portions of the project (Figures 6, 7 and 8). A general decline of the water table is evident in the record from the late-1950s to 2004. The periods of heaviest decline are evident from the late-1970s to the mid-1980s and from the late 1980s to the mid-1990s. Another period of recent decline is observed from the late 1990s to present. The groundwater level decline in the eastern and central portions of the project ranges from approximately 15 to 20 feet from 1959 to 2003 (Figures 6 and 7). On the western portion of the project, the groundwater level decline is more severe, and the total observed drop in groundwater levels ranges from approximately 20 to 50 feet. Some of the wells in the western portion of the project have gone dry due to declining groundwater levels and have been abandoned. The spring static and summer pumping water levels are well-correlated in all of the hydrographs and follow a similar downward trend.

WATER USE

Water use by A&B water district has ranged from approximately 200,000 acre-feet per year to 280,000 acre-feet per year from 1960 to the present, as presented on Figures 9a and 9b. Irrigation water use demand is as high as 790 million gallons per day (mgd), based on monthly water use records during the late-1980s to 2003. There is significant variability in water use from year to year but there is no observable increasing or decreasing trend in overall groundwater use during the 50-year operation of the Project.

DISCUSSION OF RESULTS

The following discussion is based on our analysis of the available groundwater and water use data and our regional understanding of the ESRPA.

- Ground water level declines are evident throughout the A&B service area. The groundwater level declines range from 15 to 20 feet in the eastern and central portion of the project and 20 and 50 feet in the western portion of the project. Some of the wells in the western portion of the project have been abandoned due to declining ground water levels.
- Development of the A&B units of the Minidoka Project was initiated during the late 1950s. The District reached maximum pumping in 1966. Both spring static and summer pumping levels in most wells throughout the project declined up to 5 feet between the late 1950s to approximately 1963. No further declines are evident in the A&B production well hydrographs after 1965 and groundwater levels are actually increasing, even though maximum water use occurred during 1966. Based on these observations, it is likely that the maximum initial drawdown from development of the Project was reached by the mid 1960s.
- Ground water level recovery observed in the District's production wells (spring static measurements) during the mid-1970s, mid-1980s and late-1990s occurs during periods of maximum water use and ground water pumping. Based on personal discussions with Dan Temple, the total available quantity of the A&B groundwater supply is heavily dependent upon the groundwater levels in production wells. When groundwater levels are declining on a multi-year basis, the District is forced to pump less due to the decrease in the specific capacity and available drawdown in the wells.
- The western portion of the Project has a lower density of wells per equivalent area as compared to the eastern and central areas. The most-developed groundwater production areas are located on the eastern and central portions of the project. However, the western portion of the Project has the most significant ground water level declines. If the ground water level declines were due to A&B's pumping, the largest ground water declines would be observed in the center of the A&B service area.
- Regional hydrographs from wells completed in the general vicinity of the Project also indicate water level decline in the range of 20 to 30 feet following the same trend observed in the A&B wells. The periods of recovery and decline are not correlated with periods of increased pumping. These hydrographs are presented on Figures 9 to 12 in HDR's 1998 report (copies attached).

CONCLUSIONS

The available water use and groundwater level data can be used to evaluate the probable reason for groundwater-level decline observed throughout the Project. Presented below are some preliminary conclusions:

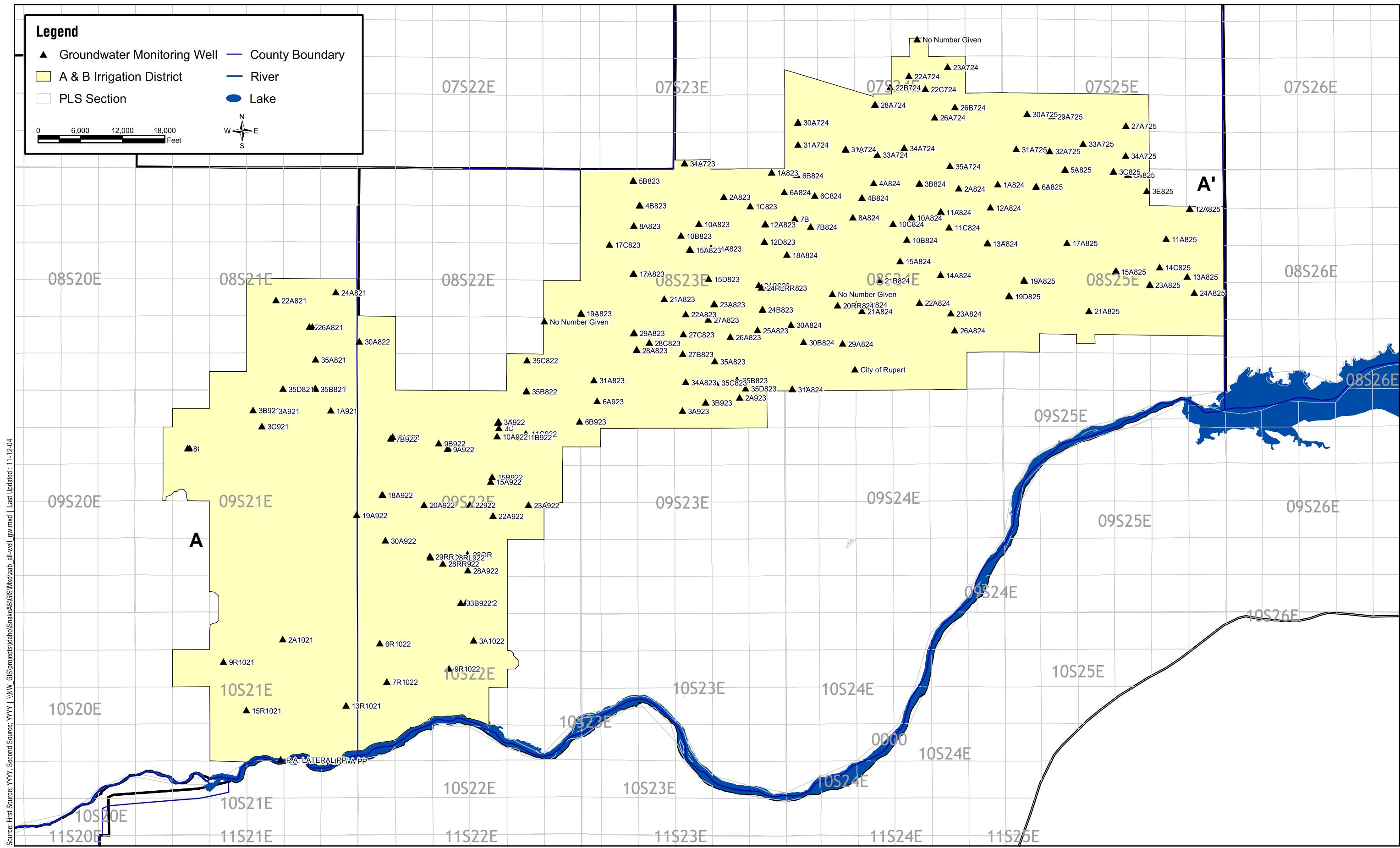
1. A&B's contribution to local groundwater level decline from development of the Project is approximately 5 feet in most areas of the District and is evident from early response to groundwater pumping.
2. More-recent groundwater level decline after the 1960s is not correlated with ground water use by the District, based on the available information. The ground water level decline observed during the last 30 years is likely due to one or more regional factors. These may include either regional ground water use, changes in irrigation practices (increased efficiency) that have decreased aquifer recharge or variability in climate and aquifer recharge. The first two parameters (regional ground water pumping and increased irrigation efficiency (decreased recharge) are likely to be the major cause of decline, since short-term climatic droughts or wet periods are not correlated with the long-term persistent decline in ground water levels across the project.
3. More information and analysis is needed to definitively evaluate the cause of groundwater level decline. The effects of local changes in irrigation practices, regional pumping and surface water boundaries on the aquifer require further investigation. A summary of proposed tasks is described below.

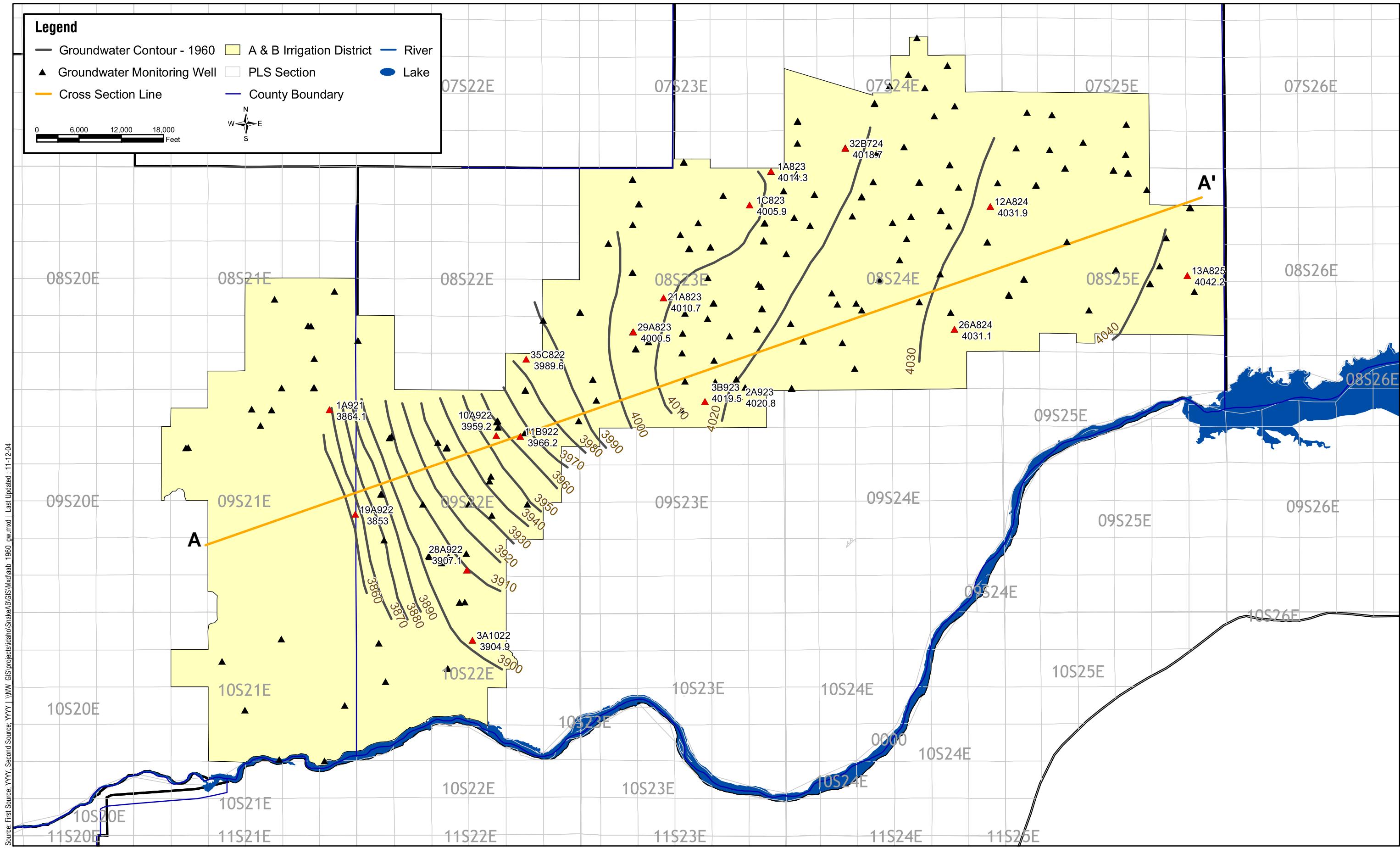
RECOMMENDED INVESTIGATION TASKS

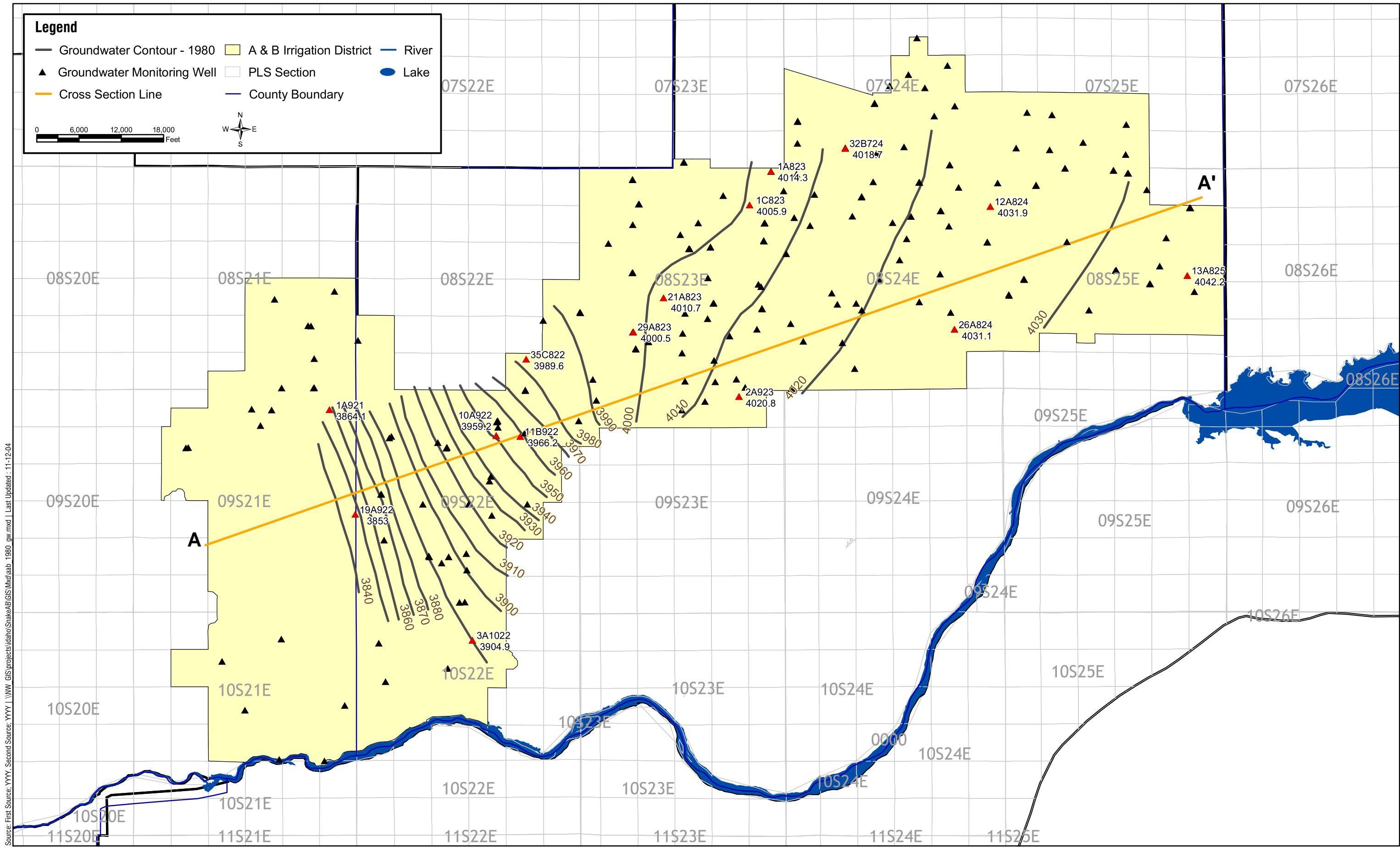
We recommend completing additional hydrogeologic investigations to collect additional information. This information is necessary to identify the cause of regional ground water level decline and to assist in establishing potential injury to A&B from foregone diversions. We recommend the following specific actions:

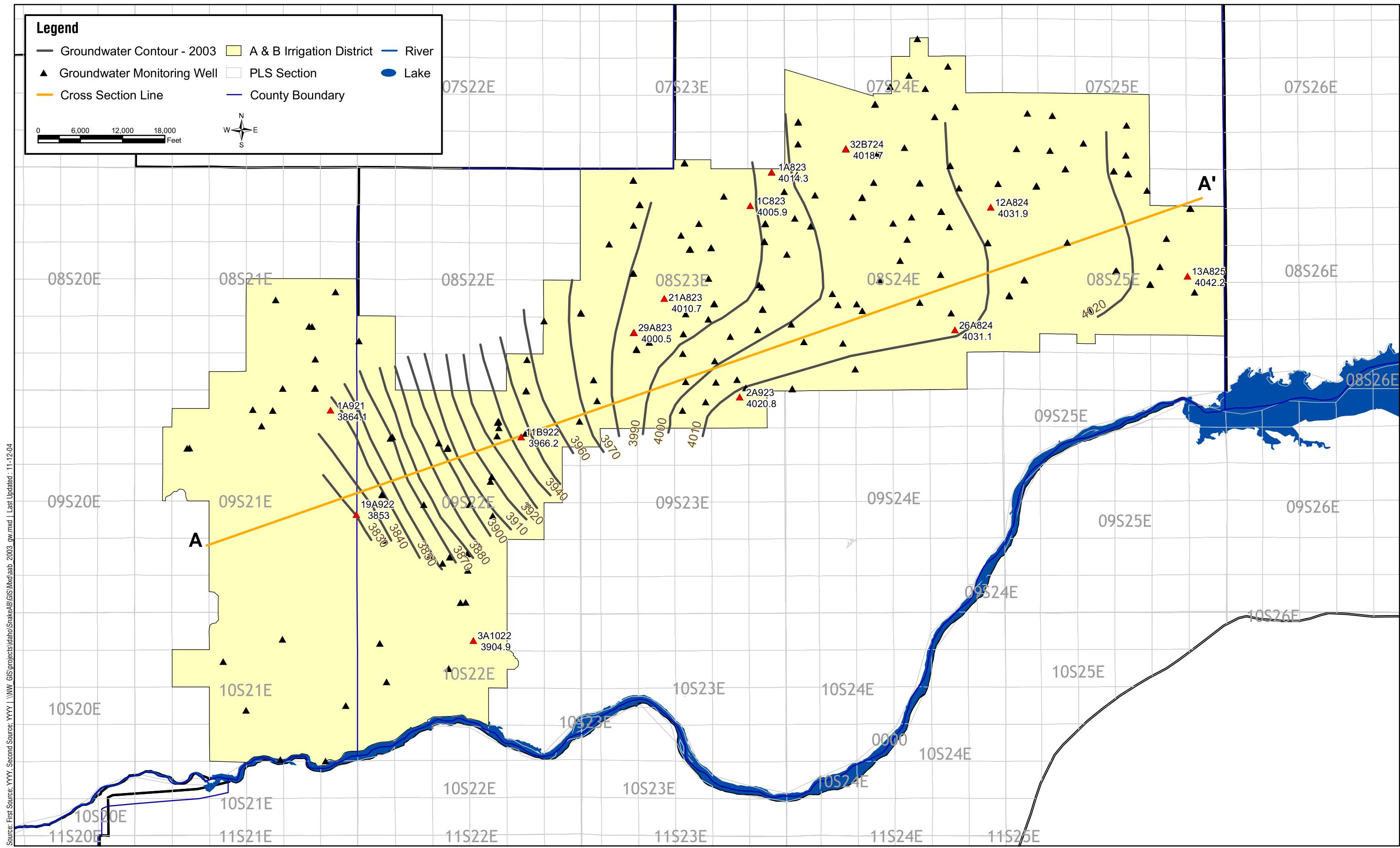
1. Develop a GIS database to be used to manage and present data.
2. Continue compiling limited regional ground information as available from previous reports. Collect quantitative information on regional ground water levels and observed regional ground water decline in the ESRPA that can be used in a GIS database. Develop maps and figures identifying ground water levels and declines correlated to the A&B district.
3. Compile information on aquifer hydraulic properties from the A&B Irrigation District aquifer pumping tests and from nearby wells. Compile regional information on the ESRPA hydraulic properties including the effects of geologic structure on aquifer transmissivity, water use and aquifer response. Develop graphical figures showing the distribution of aquifer transmissivity for the ESRPA and the A&B District.

4. Compile information on the Snake River water surface profile and flow. Correlate regional ground water level and Snake River water surface profile data to identify regional flow paths in the vicinity of A&B. Correlate ground water levels, surface water flow and climatic variability.
5. Identify and map ground water users in close proximity to the District. Map order of priority, water right allocation and pumping volumes. Collect information on regional ground water pumping and ground water allocation on the ESRPA. Identify areas with heaviest pumping and identify ground water users by priority.
6. Collect information on regional surface water allocation and irrigation. Compile information on regional irrigation efficiency. Identify potential alterations to aquifer recharge from nearby surface water diversions or changes in aquifer recharge.
7. Compile regional climate and aquifer recharge data to determine periods of climatic variability. Perform a simple trend analysis to identify dry and wet periods in the record. Correlate climate variability to aquifer pumping, aquifer groundwater levels, Snake River flow data and other pertinent hydrologic factors affecting groundwater levels in the ESRPA.
8. Perform a more-detailed hydrogeologic analysis using the information collected above. Identify quantitative and empirical evidence describing the reasons for groundwater levels declines observed in the A&B area. Focus on reasons why the western portion of the District is experiencing the most significant declines. Explain regional and climatic effects of water level decline. Evaluate the effects of regional pumping on groundwater level decline in the District. Evaluate priority of use and the relative impact of regional pumping by users junior to A&B. Provide information to assist in quantifying injury.
9. Obtain the revised ESRPA groundwater model. Investigate other available groundwater models developed for the ESRPA. Evaluate the model(s) calibration and input data as possible based on available data. Evaluate whether the models can be used to estimate the cause of ground water level decline in the A&B Irrigation District. Consider altering the models or developing a revised model to describe the resultant decline and potential injury to A&B's ground water supply.









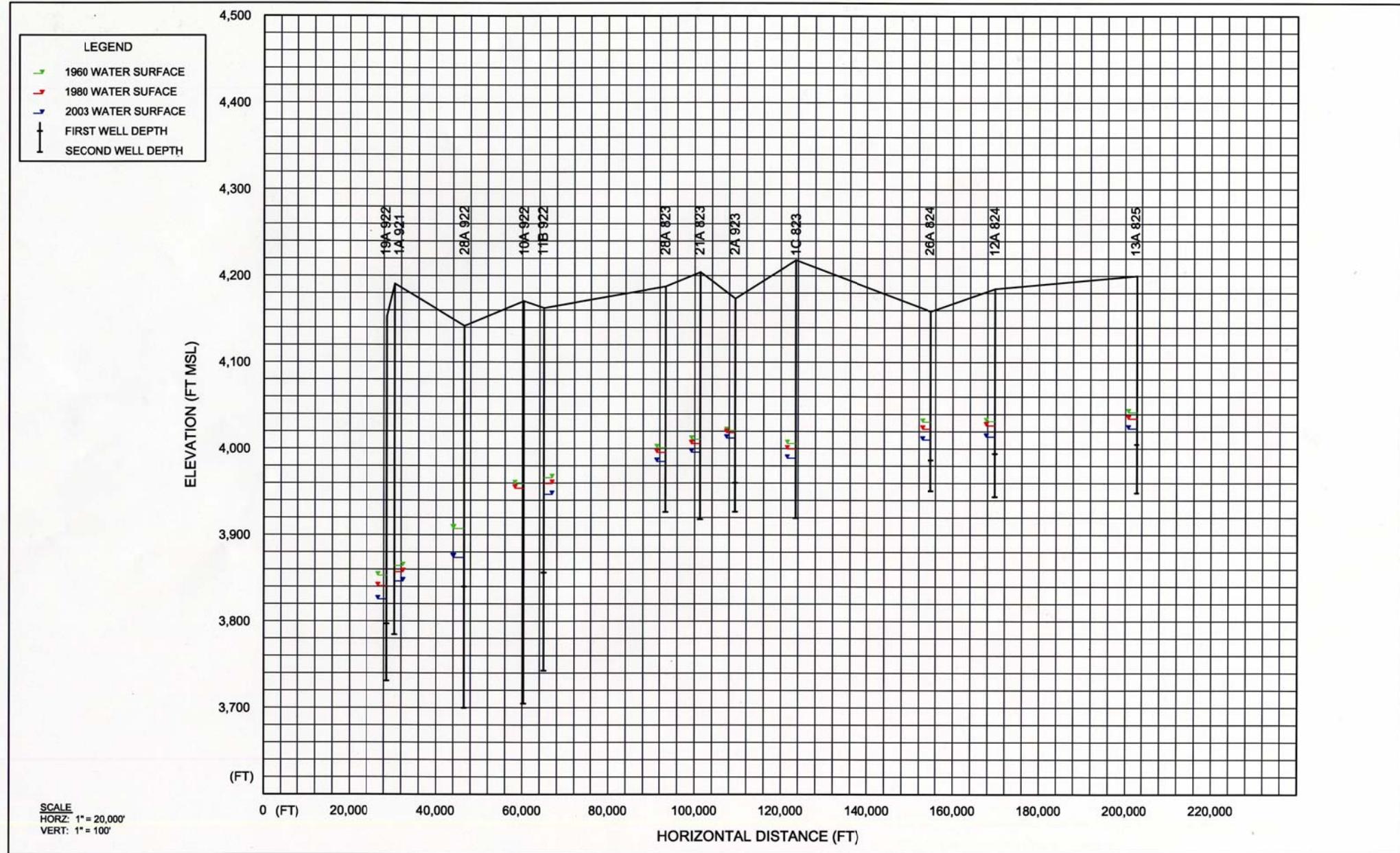


FIGURE 5 HYDROGEOLOGIC SECTION A-A'

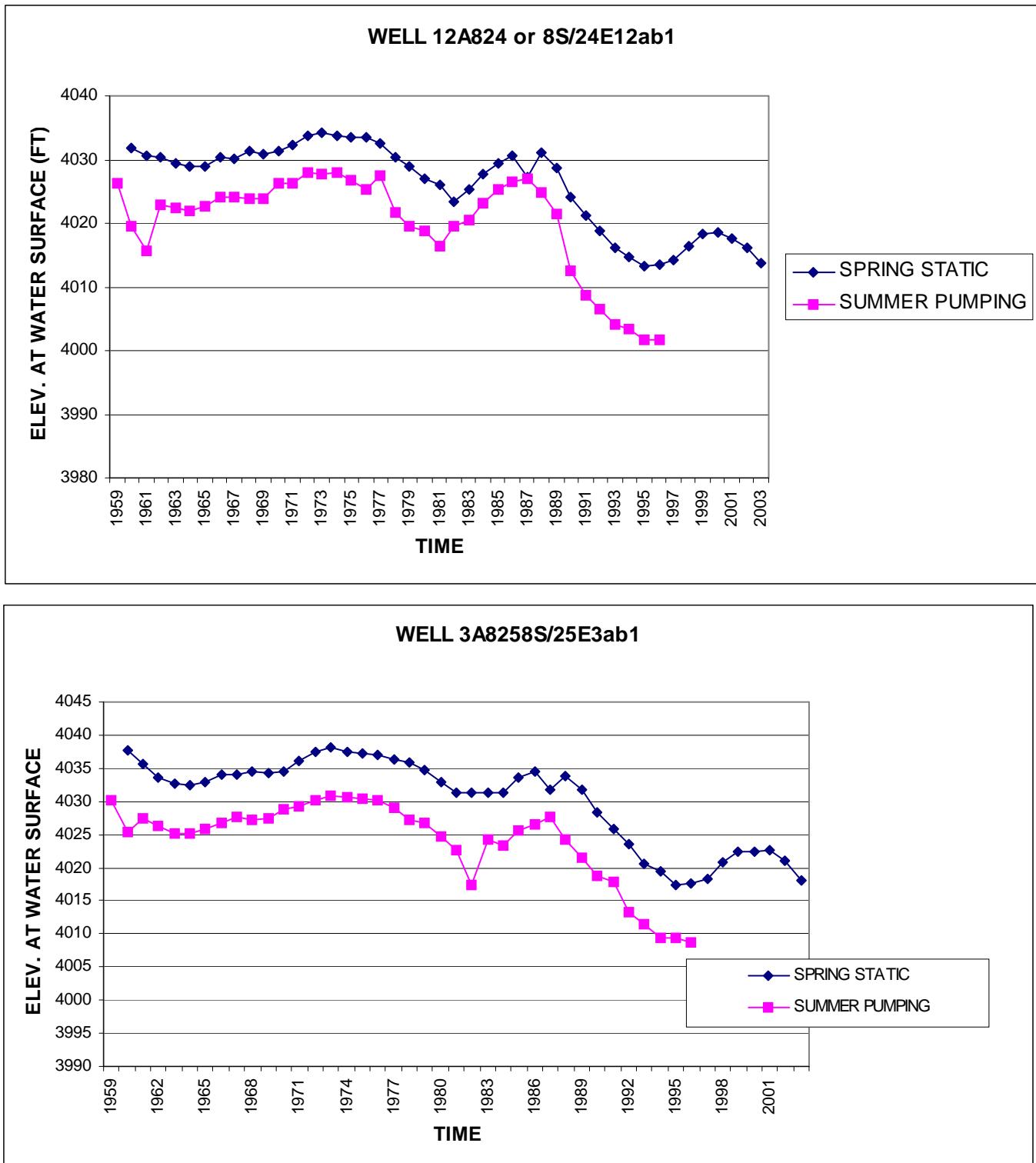


Figure 6 Ground water hydrographs for wells in the east of the A&B Irrigation District

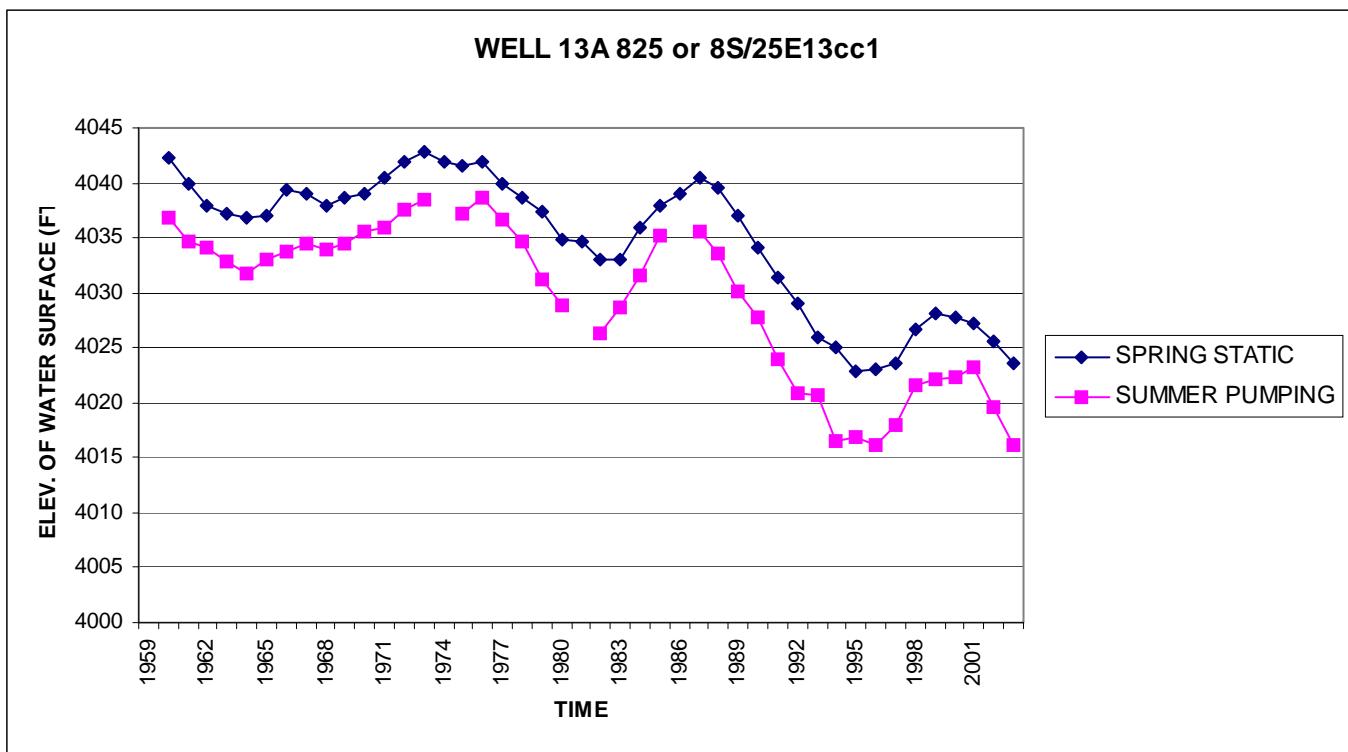
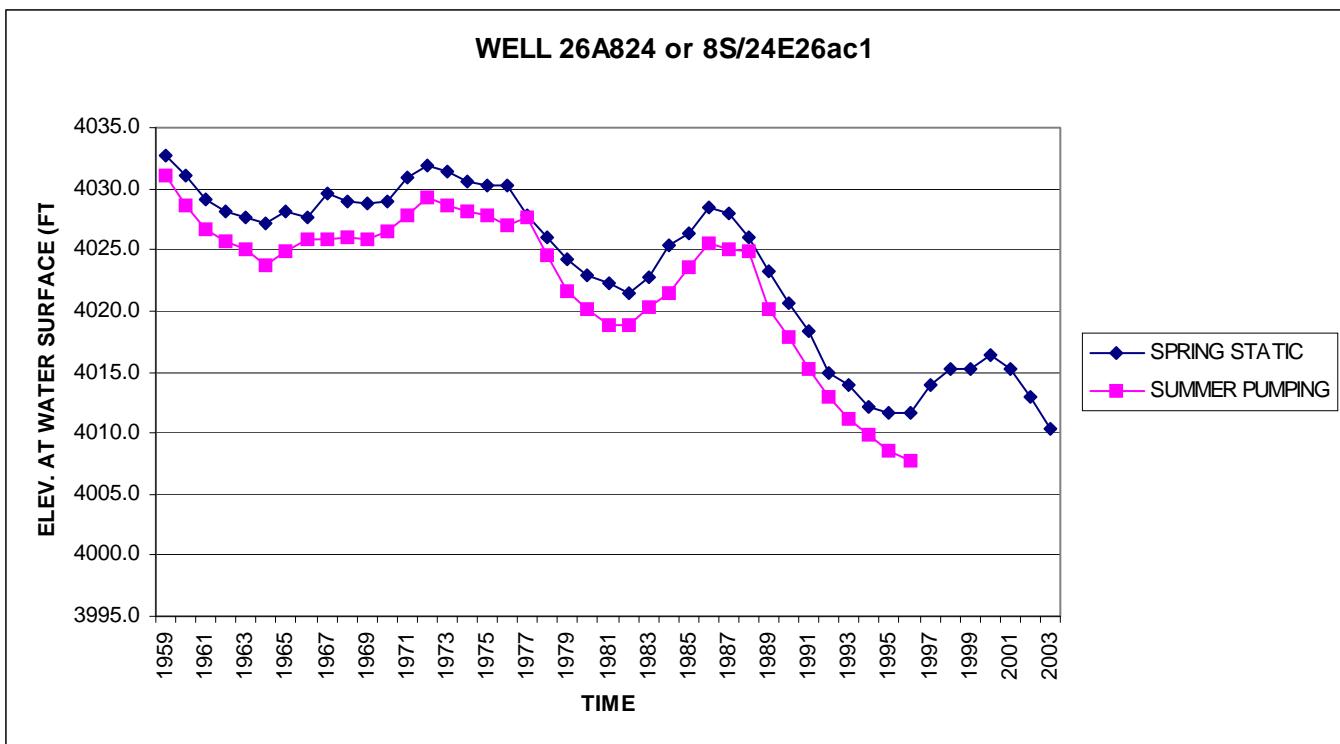


Figure 6 cont. Ground water hydrograph for wells in the east of the A&B Irrigation District

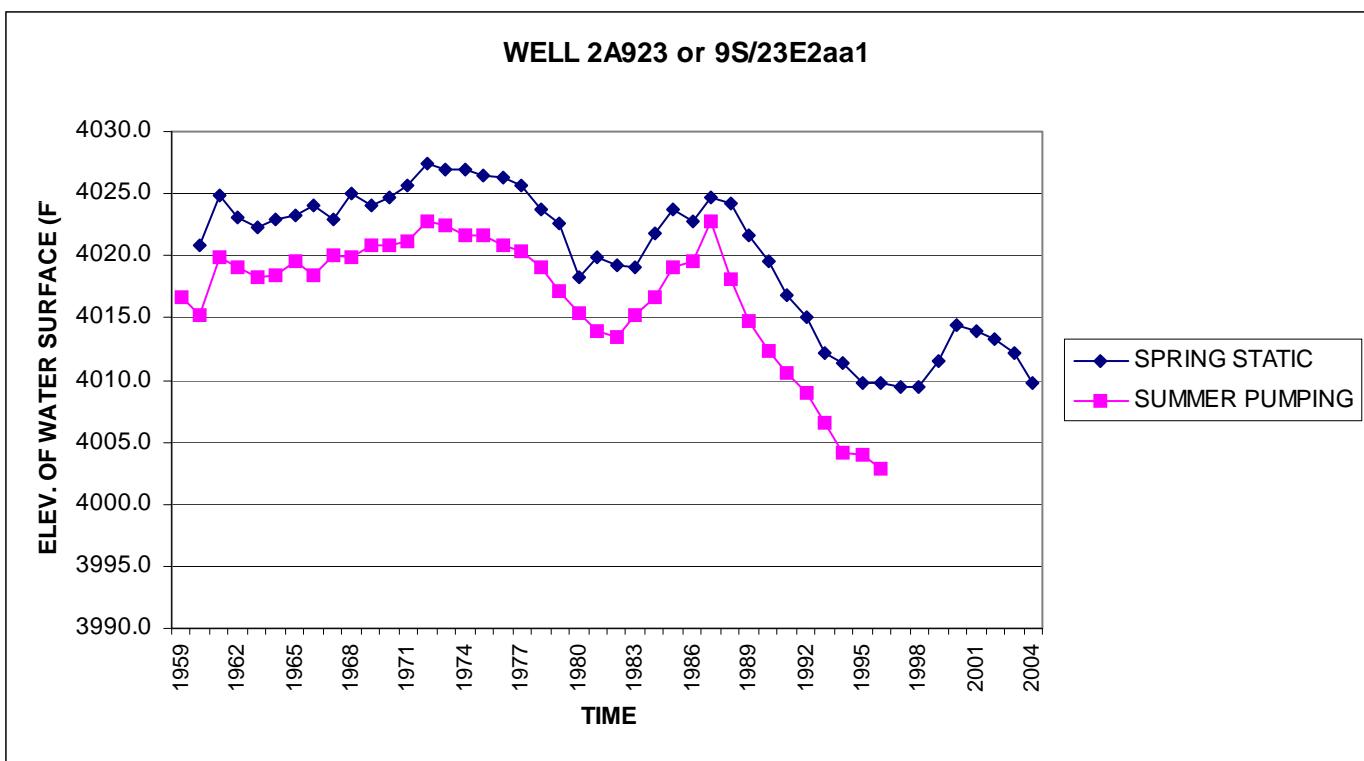
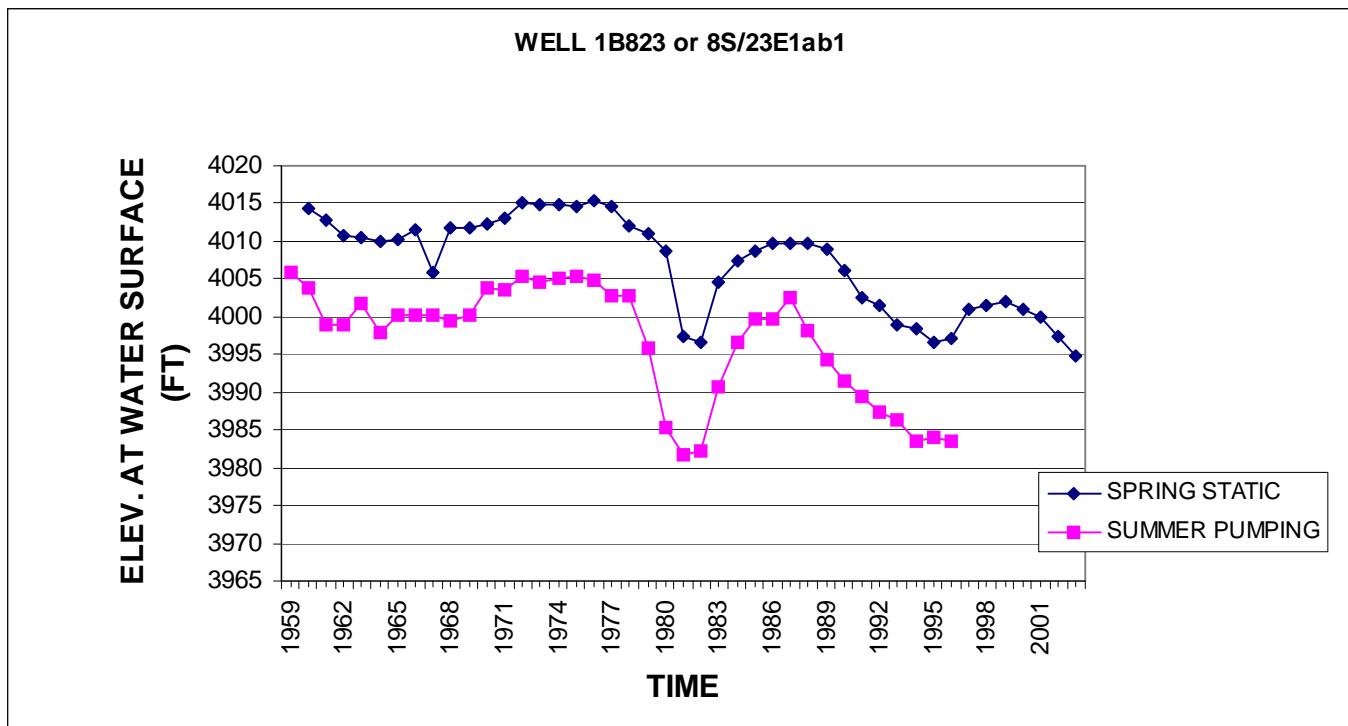


Figure 7 Ground water hydrographs for wells in the center of the A&B Irrigation District

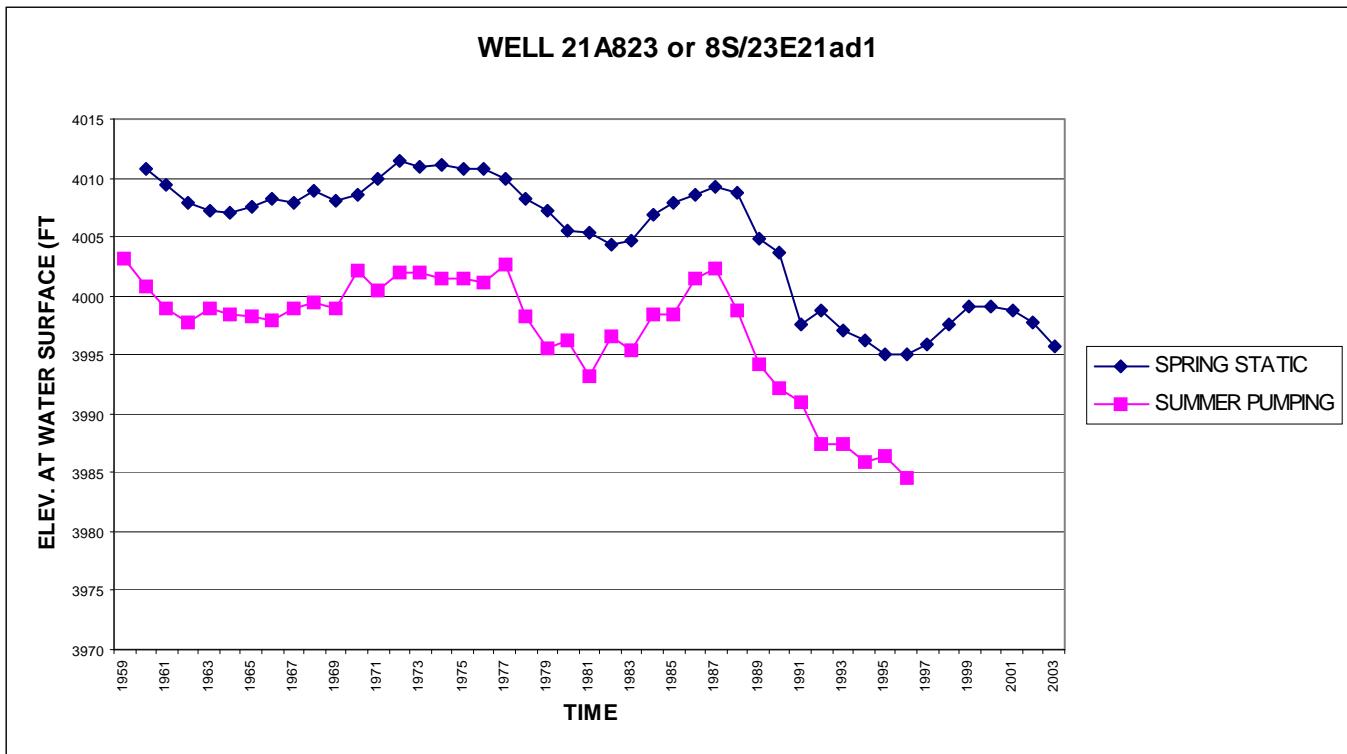
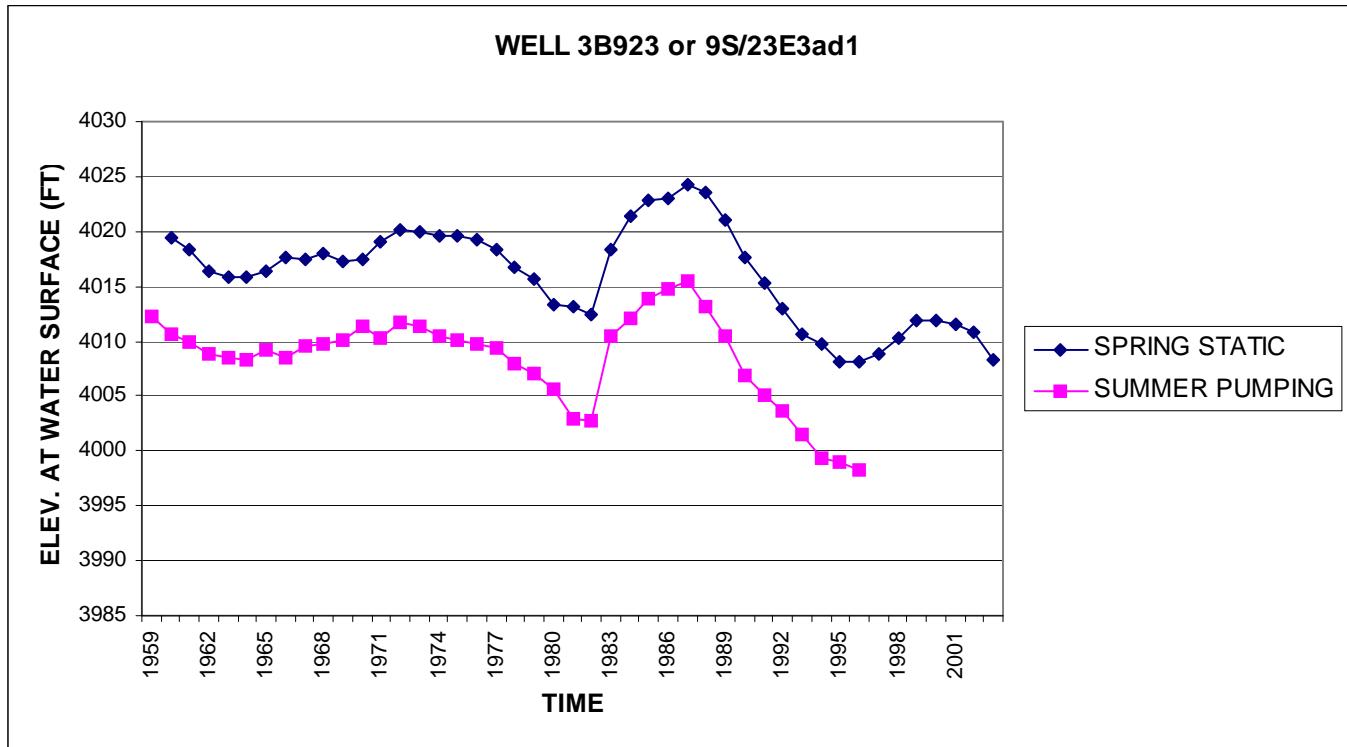


Figure 7 cont. Ground water hydrographs for wells in the center of the A&B Irrigation District

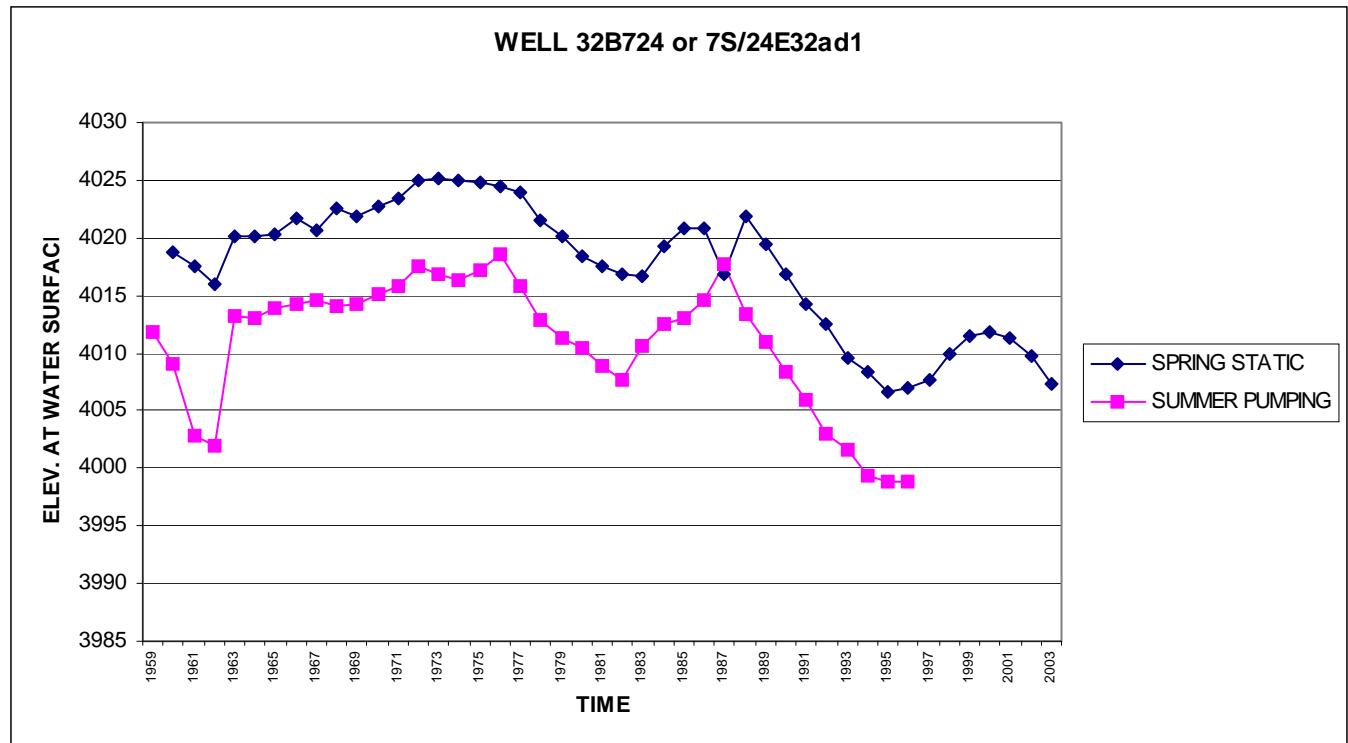
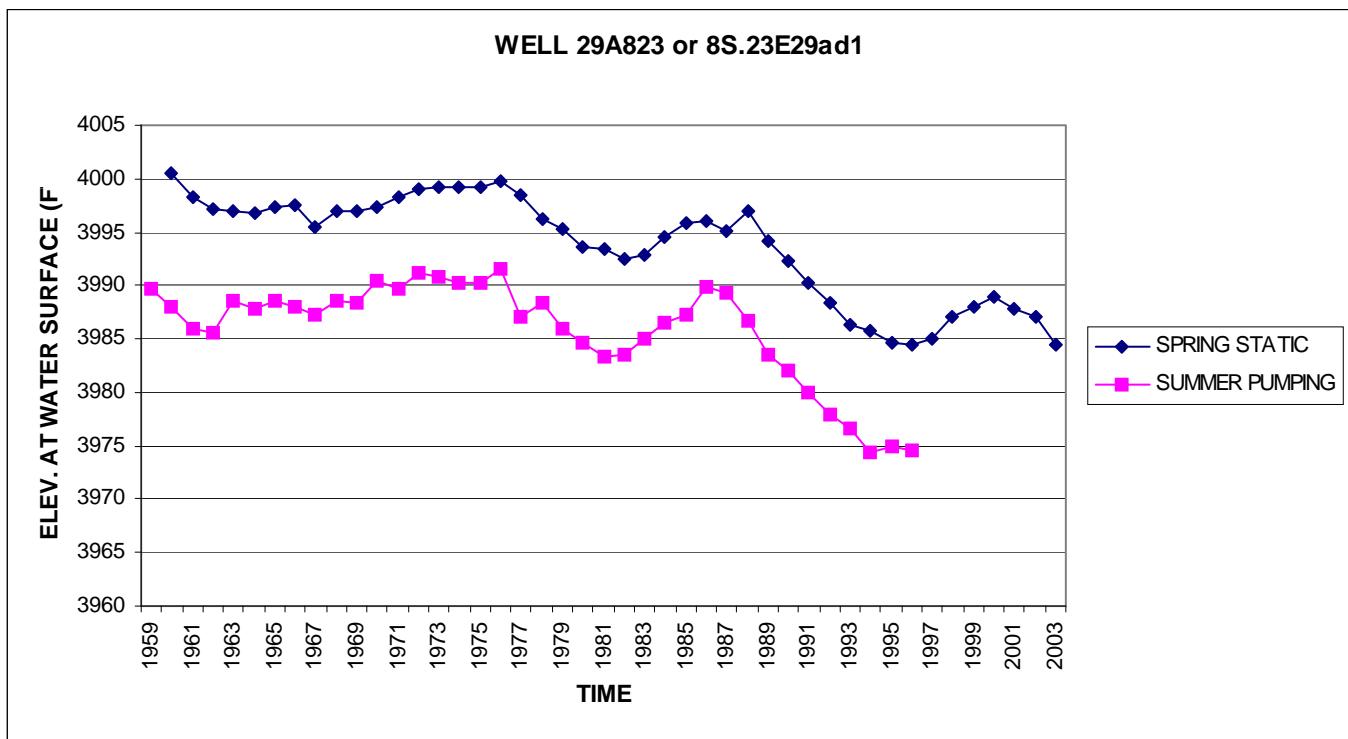


Figure 7 cont. Ground water hydrographs for wells in the center of the A&B Irrigation District

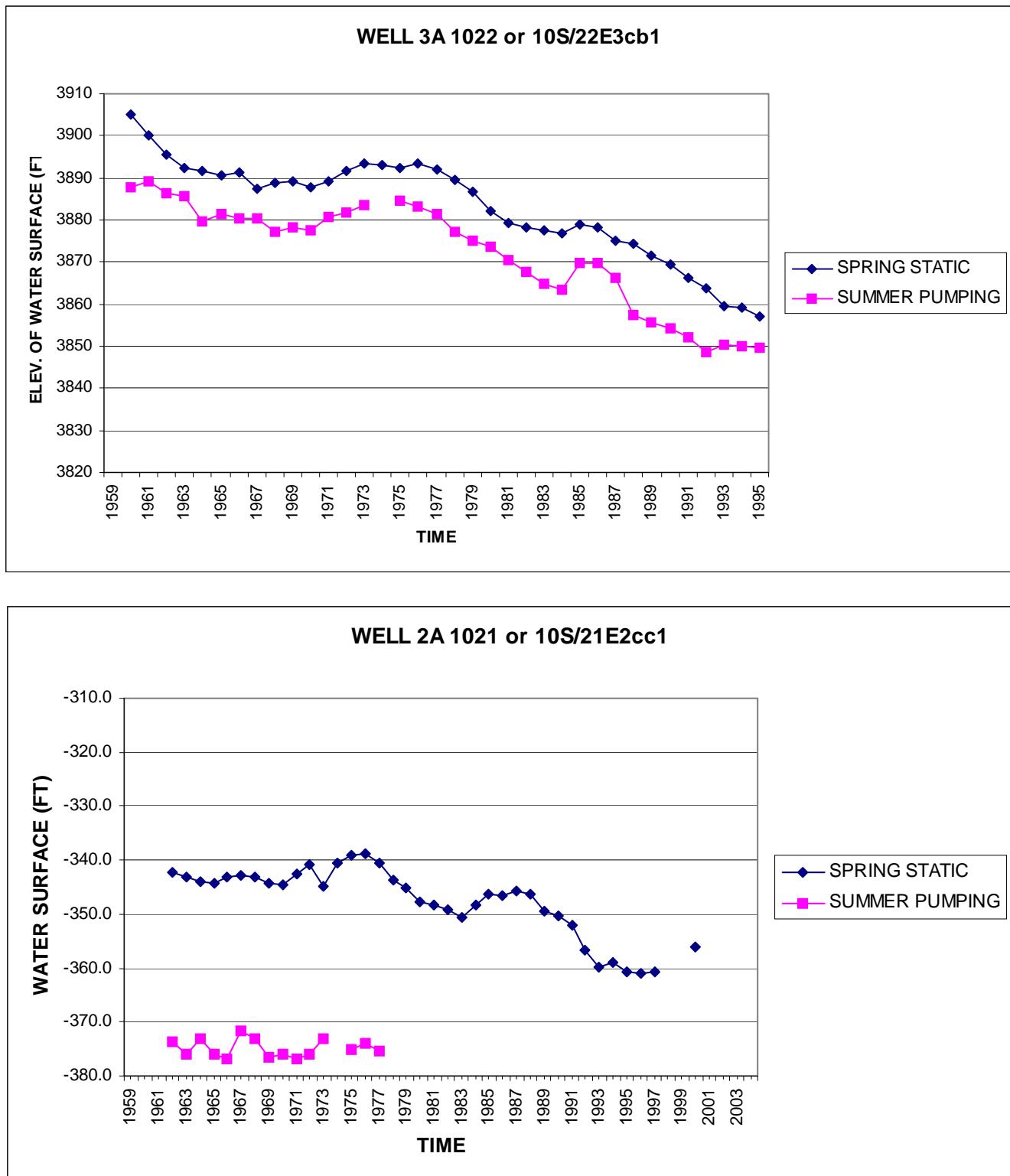


Figure 8 Ground water hydrographs for wells in the west of the A&B Irrigation District

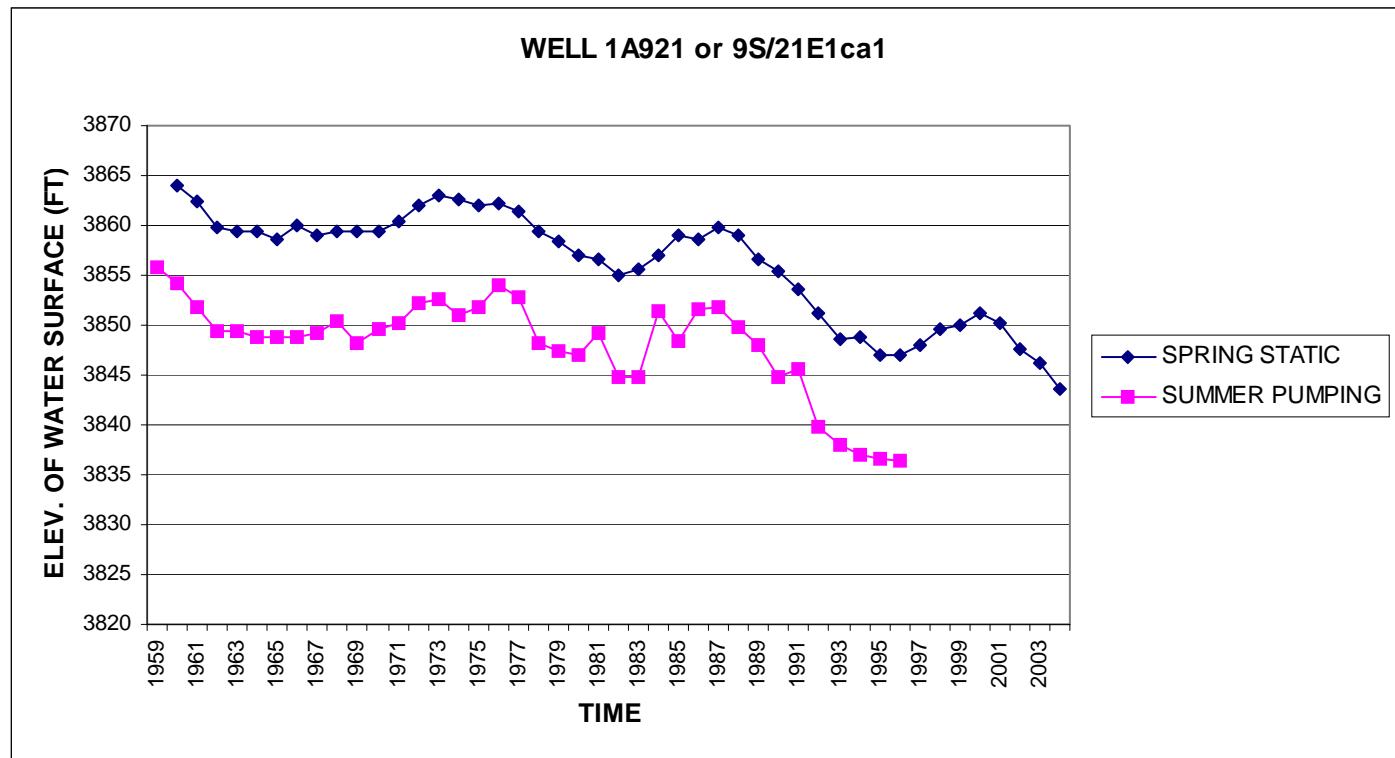
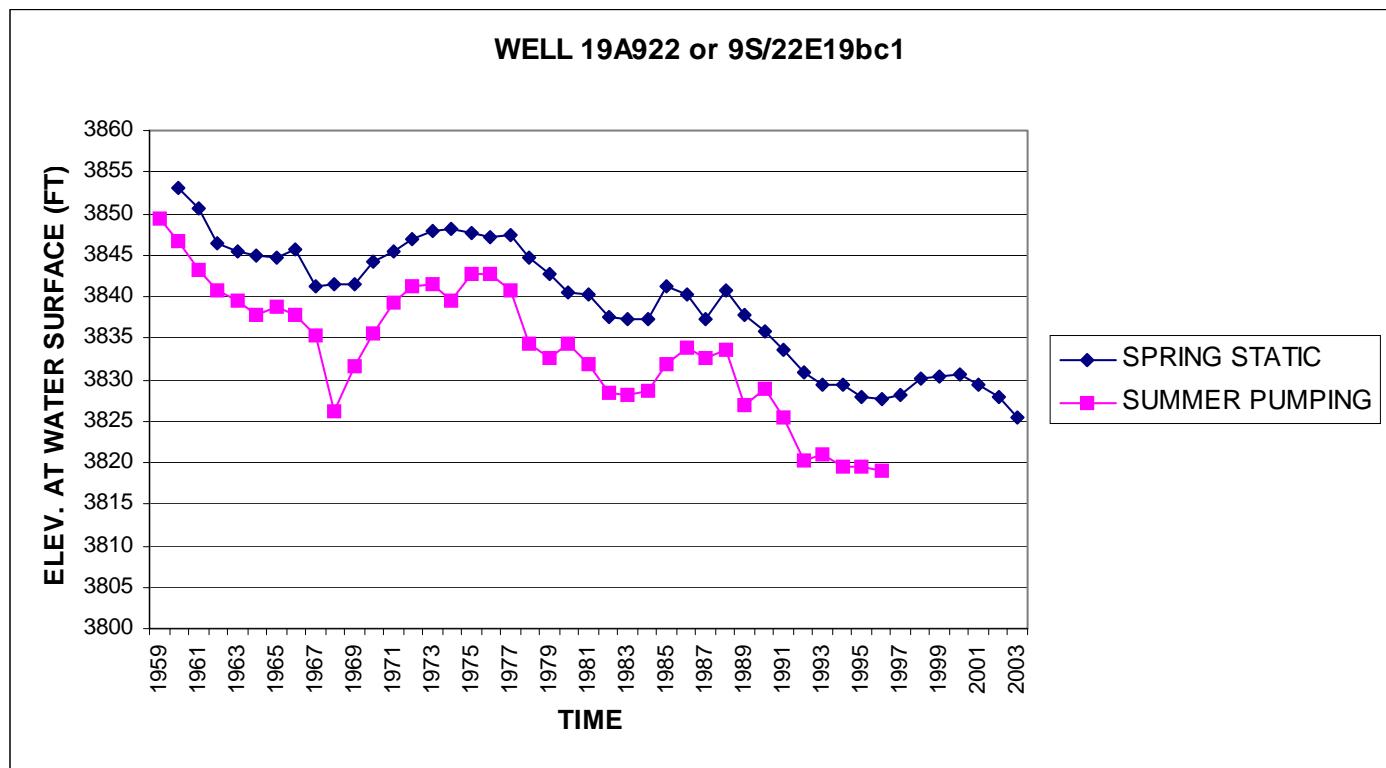


Figure 8 cont. Ground water hydrographs for wells in the west of the A&B Irrigation District

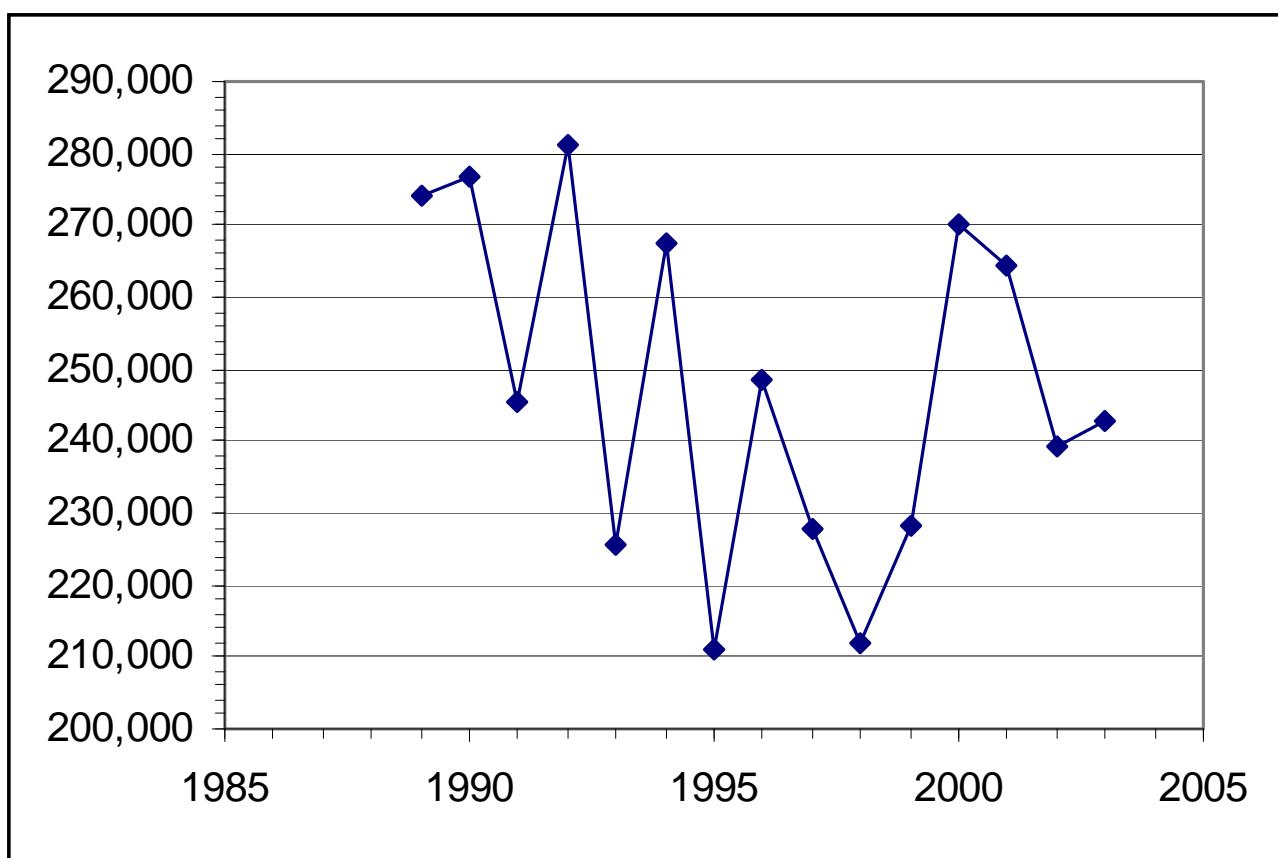


Figure 9b Annual groundwater pumping for A&B Irrigation District (acre-feet)

Table 1 Specifications for A&B Irrigation District Production Wells

Well ID	T/R Well ID	Township	Range	Section	Quarter Section	Ground Elevation (ft)	Initial Depth to Ground Water (ft)	Initial Ground Water Elevation (ft)		Well Construction Date	Second Well Depth (ft)	Second Well Deepening Drill Date	Third Well Depth (ft)	Third Well Deepening Drill Date	Fourth Well Depth (ft)	Fourth Well Deepening Drill Date	Well Casing Diameter (in)	Final Well Depth (ft)	Casing Depth (ft)	Initial Aquifer Test Rate (cfs)	Initial Aquifer Test Rate (gpm)	Initial Aquifer Test Drawdown (ft)
								Initial Well Depth (ft)	Initial Well Elevation (ft)													
01A823	8S/23E1ab2	8S	23E	1	ab2	4302.8	235.1	4067.7	369.4	1954							369.4	24	20	10	4488	0.8
01A824	8S/24E1da1	8S	24E	1	da1	4254.2	166.7	4087.5	211.4	1955	227.4	1960					227.4	20	227	5.7	2558	1.1
01A921	9S/21E1ca1	9S	21E	1	ca1	4240.4	322.2	3918.2	406.1	1956							406.1	20	11	3.2	1436	1.1
01B823	8S/23E1ab1	8S	23E	1	ab1	4302.9	235.3	4067.6	371.3	1954							371.3	20	25	4.9	2199	6.1
01C823	8S/23E1cc1	8S	23E	1	cc1	4268.1	204.9	4063.2	298.9	1954							298.9	20	28	7.4	3321	4.5
02A1021	10S/21E2cc1	10S	21E	2	cc1		336.0		646.0	1960							646	20	32	5	2244	32.5
02A823	8S/23E2ca1	8S	23E	2	ca1	4279.0	214.1	4064.9	326.5								326.5	20	28.3	0		
02A824	8S/24E2da1	8S	24E	2	da1	4248.3	165.3	4083.0	204.0	1956	236	1961					236	12	191	1.9	853	0
02A923	9S/23E2aa1	9S	23E	2	aa1	4223.5	141.6	4081.9	213.5	1955	247	1984					247	17	247	1.7	763	2
03A1022	10S/22E3cb1	10S	22E	3	cb1	4220.7	255.0	3965.7	400.0	1956	429						429	16	394	3.5	1571	3.3
03A824	8S/24E3da1	8S	24E	3	da1	4270.8	183.8	4087.0	340.0	1954						340	24	24	8.5	3815	3.2	
03A825	8S/25E3ab1	8S	25E	3	ab1	4301.0	208.5	4092.5	359.0	1956							359	24	15	7.8	3501	6.7
03A921	9S/21E3ad1	9S	21E	3	ad1	4202.0	301.4	3900.6	342.0	1956	401	1962					401	16	87	1.9	853	0.8
03A922	9S/22E3dd1	9S	22E	3	dd1		222.0										320	20	10	5.7	2558	2.6
03A923	9S/23E3cb1	9S	23E	3	cb1	4222.9	167.5	4055.4	289.0	1955	340	1955	380	1963			380	12	256	4.5	2020	16.2
03B824	8S/24E3da2	8S	24E	3	da2	4270.8	184.0	4086.8	302.3	1954							302.3	20	23	4.2	1885	0.1
03B825	8S/25E3ab2	8S	25E	3	ab2	4300.9	209.3	4091.6	340.4	1956							340.4	20	15	5.7	2558	5
03B921	9S/21E3bd1	9S	21E	3	bd1	4196.6	299.7	3896.9	341.0	1956	390	1962	437	1984			437	16	21	6.7	3007	1.3
03B922	9S/22E3dd2	9S	22E	3	dd2	4236.2	221.5	4014.7	267.0	1955	327	1963					327	16	16	4.4	1975	0.5
03B923	9S/23E3ad1	9S	23E	3	ad1	4214.3	133.9	4080.4	285.0	1955							285	23	0			
03C825	8S/25E3bb1	8S	25E	3	bb1	4292.9	202.3	4090.6	367.0	1955							367	20	29	5.8	2603	6.4
03C921	9S/21E3dc1	9S	21E	3	dc1	4197.7	302.4	3895.3	337.0	1956	396	1956	424	1984	700	1993	700	16	346	7	3142	0.3
03D825	8S/25E3bb2	8S	25E	3	bb2	4294.1	203.0	4091.1	258.0	1956	381	1964					381	16	30	2.9	1302	3.4
03E825	8S/25E3da1	8S	25E	3	da1	4300.9	210.8	4090.1	303.7	1957							3037	20	10	4.1	1840	0.4
04A823	8S/23E4cc1	8S	23E	4	cc1	4290.8	233.0	4057.8	368.0	1954							368	24	16	4.5	2020	0.6
04A824	8S/24E4ac1	8S	24E	4	ac1	4267.6	185.3	4082.3	321.0	1954							321	24	49	8.9	3994	6.9
04B823	8S/23E4cc2	8S	23E	4	cc2	4290.4	232.0	4058.4	311.0	1954							311	24	16	4.5	2020	0.7
04B824	8S/24E4ca1	8S	24E	4	ca1		192.4										313	24	37	8.2	3680	6.2
04C824	8S/24E4cd1	8S	24E	4	cd1		196.0										305	20	52	0		
05A825	8S/25E5aa1	8S	25E	5	aa1	4284.6	198.5	4086.1	238.2	1957	280	1963	290	1983			290	24	232	10.5	4712	3
05B823	8S/23E5aa2	8S	23E	5	aa2	4296.5	238.7	4057.8	338.8	1955							338.8	24	9	6.3	2827	5.6
05B825	8S/25E5aa2	8S	25E	5	aa2	4285.0	199.8	4085.2	239.5	1957	280	1963					280	18	224	5.3	2379	0.8
05C823	8S/23E5aa1	8S	23E	5	aa1	4297.0	237.8	4059.2	388.0	1955							388	24	9	3.1	1391	1.5
06A824	8S/24E6cb1	8S	24E	6	cb1	4296.1	229.0	4067.1	364.0	1949							364	20	35	0		
06A825	8S/25E6ad2	8S	25E	6	ad2	4252.3	166.9	4085.4	205.0	1957	257	1961					257	20	184	6.1	2738	1.8
06A923	9S/23E6aa1	9S	23E	6	aa1	4225.0	174.3	4050.7	226.0	1950	259	1962					259	16	244	7.8	3501	1.2
06B824	8S/24E																					

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								Initial Well Depth (ft)	Water Elevation (ft)													
12B825	8S/25E12bb1	8S	25E	12	bb1	4279.9	187.0	4092.9	228.5	1956	295	1983					32	16	273	5	2244	4.1
12C823	8S/23E12cd1	8S	23E	12	cd1	4263.3	197.7	4065.6	267.5	1954	290						290	24	28	7.8	3501	4.05
12D823	8S/23E12cd2	8S	23E	12	cd2	4262.0	196.5	4065.5	298.6	1954						298.6	20	26	3.9	1750	3.3	
13A824	8S/24E13ab1	8S	24E	13	ab1	4244.8	154.8	4090.0	226.7	1954	250	1963					250	20	48	10.3	4623	0.44
13A825	8S/25E13cc1	8S	25E	13	cc1	4249.9	157.0	4092.9	195.0	1956	251.3	1960					251.3	16	10	2.5	1122	5.9
13B824	8S/24E13ab2	8S	24E	13	ab2	4244.8	154.8	4090.0	209.4	1954	246	1984					246	20	39	5	2244	0.21
14A823	8S/23E14bb2	8S	23E	14	bb2	4258.5	198.2	4060.4	251.3	1954	296.8	1961					296.8	16	7.75	9	4039	0.56
14A824	8S/24E14cd1	8S	24E	14	cd1	4220.0	132.3	4087.7	235.0	1952						235	24	36	8.46	3797	1.3	
14B823	8S/23E14bb1	8S	23E	14	bb1	4258.7	198.3	4060.4	278.6	1954						278.6	20	11	4.5	2020	6	
14C825	8S/25E14ca1	8S	25E	14	ca1	4255.8	162.7	4093.1	209.3	1955	257.7	1964					257.7	16	13.5	2.2	987	0.1
15A724	7S/24E15db1	7S	24E	15	db1	4299.5	221.4	4078.1	285.0	1956						285	16	10	2	898	0.3	
15A823	8S/23E15ba1	8S	23E	15	ba1	4268.2	209.4	4058.8	266.2	1954	307					307	24	9	10	4488	3.8	
15A824	8S/24E15ca1	8S	24E	15	ca1	4233.8	148.5	4085.3	232.0	1953						232	20	41	5.4	2424	0.5	
15A825	8S/25E15cc1	8S	25E	15	cc1	4244.5	152.0	4092.5	208.0	1955	271	1963					271	24	20	8.7	3905	5.2
15A922	9S/22E15ac1	9S	22E	15	ac1	4208.3	236.7	3971.6	388.0	1957						388	24	24	2.8	1257	30	
15B823	8S/23E15ba2	8S	23E	15	ba2	4268.0	209.3	4058.7	302.2	1954						302.2	20	12	5	2244	6.4	
15B825	8S/25E15cc2	8S	25E	15	cc2	4244.5	152.7	4091.8	200.3	1956	250	1959					250	20	116	4	1795	14.9
15B922	9S/22E15ac2	9S	22E	15	ac2	4208.1	197.5	4010.6	239.0	1957	391	1959					391	16	21	0		
15D823	8S/23E15dd1	8S	23E	15	dd1	4251.1	193.0	4058.1	258.0	1955	287	1961					287	20	10	2.2	987	3
17A823	8S/23E17dd1	8S	23E	17	dd1	4253.9	198.7	4055.2	270.0	1955	305	1964					305	20	14	5.8	2603	8.2
17A825	8S/25E17aa1	8S	25E	17	aa1	4220.6	131.3	4089.3	170.0	1956	211	1961					211	20	26	6.8	3052	2.7
17B823	8S/23E17dd2	8S	23E	17	dd2	4253.7	198.4	4055.3	278.0	1955						278	16	25	2.9	1302	2.9	
17C823	8S/23E17ba1	8S	23E	17	ba1	4275.6	223.3	4052.3	270.0	1954	302					302	12	8	1.9	853	1.3	
18A824	8S/24E18bc1	8S	24E	18	bc1	4247.5	181.9	4065.6	265.0							265	24		8.9	3994	5	
18A922	9S/22E18dc1	9S	22E	18	dc1	4201.3	247.0	3954.3	298.5	1955	332	1961					322	20	10	5.6	2513	1.2
18B922	9S/22E18dc2	9S	22E	18	dc2	4201.4	247.5	3953.9	310.0	1956	340	1965					340	20	12	2.8	1257	0.75
19A823	8S/23E19dc1	8S	23E	19	dc1	4265.9	215.9	4050.0	282.0	1955	300	1963					300	20	21	6.6	2962	6
19A825	8S/25E19ab2	8S	25E	19	ab2	4212.4	120.1	4092.3	217.5	1954						217.5	24	64	9.4	4219	4.2	
19A922	9S/22E19bc1	9S	22E	19	bc1	4202.9	293.4	3909.5	356.2	1955	422	1959					422	18	387	4.4	1975	3.4
19B823	8S/23E19dc2	8S	23E	19	dc2	4265.9	213.7	4052.2	259.0	1955	290	1963					290	20	35	3.2	1436	0.2
19B825	8S/25E19ab1	8S	25E	19	ab1	122.5			217.5	1954						217.5	24	69	0			
19C825	8S/25E19bd1	8S	25E	19	bd1	4218.5	126.8	4091.7	224.7	1954						224.7	20	31	7.5	3366	1.5	
19D825	8S/25E19bd2	8S	25E	19	bd2	4218.4	126.5	4091.9	222.0	1954						222	20	30	3.7	1661	1.6	
20A824	8S/24E20bd1	8S	24E	20	bd1	4216.9	142.4	4074.5	365.0	1954						365	20	25	4.3	1930	40	
20A922	9S/22E20aa1	9S	22E	20	aa1	4209.1	251.0	3958.1	375.0	1956	700	1981					700	16		6.7	3007	5
21A823	8S/23E21ad1	8S	23E	21	ad1	4253.9	186.8	4067.1	286.0	1955</td												

Table 1 Specifications for A&B Irrigation District Production Wells

Well ID	T/R Well ID	Township	Range	Section	Quarter Section	Initial Ground Water		Well Construction Date	Second Well Depth (ft)	Second Well Deepening Drill Date	Third Well Depth (ft)	Third Well Deepening Drill Date	Fourth Well Depth (ft)	Fourth Well Deepening Drill Date	Well Casing		Initial Aquifer Test Rate (cfs)	Initial Aquifer Test Rate (gpm)	Initial Aquifer Test Drawdown (ft)		
						Ground Elevation (ft)	Initial Depth to Ground Water (ft)								Elevation (ft)	Diameter (in)	Depth (ft)				
26B724	7S/24E26ac1	7S	24E	26	ac1	4270.9	187.7	1956	234.6	308	1955				308	16	12	2.5	1122	0	
26B821	8S/21E26aa1	8S	21E	26	aa1	4249.4	326.8	1955	3922.6		1955				587.8	20	14	2.8	1257	4.3	
27A725	7S/25E27cd1	7S	25E	27	cd1	4299.4	208.3	1956	4091.1		1956				346.4	16	9	2	898	0.35	
27A823	8S/23E27aa1	8S	23E	27	aa1	4242.9	186.1	1950	4056.8	243.0	1954	300	1962		300	20	20	0			
27B823	8S/23E27cd1	8S	23E	27	cd1	4224.8	167.5	1954	4057.3	229.0	1954				229	20	24	3.3	1481	1	
27C823	8S/23E27bd1	8S	23E	27	bd1	4234.5	178.0	1948	4056.5	262.0					262	20	21	4.5	2020	8.5	
28A724	7S/24E28ac2	7S	24E	28	ac2	4293.2	213.5	1955	4079.7	303.0	1955	351	1984		351	20	24	6.2	2783	2.2	
28A823	8S/23E28cc1	8S	23E	28	cc1	4237.4	183.0	1954	4054.4	261.0	1954				261	24	19	4.8	2154	0.5	
28A922	9S/22E28dd1	9S	22E	28	dd1	4191.7	229.6	1956	3962.1	302.0	1956	442	1964		442	14	102	2.5	1122	18	
28B724	7S/24E28ac1	7S	24E	28	ac1	4293.0	212.7	1955	4080.3	353.5	1955				353.5	20	20.6	3.1	1391	0.5	
28B823	8S/23E28cc2	8S	23E	28	cc2	4237.7	183.0	1954	4054.7	220.0	1954	263	1962		263	20	16.7	5.5	2468	0.5	
28C823	8S/23E28ca1	8S	23E	28	ca1	4232.1	176.3	1954	4055.8	251.0	1954	300	1984		300	20	17	4.8	2154	0.5	
29A725	7S/25E29ca1	7S	25E	29	ca1	4328.7	241.8	1957	4086.9	268.5	1957	323	1960	365	1983	365	16	294	4.4	1975	0.5
29A823	8S/23E29ad1	8S	23E	29	ad1	4243.6	189.4	1955	4054.2	249.0	1955	286	1963		286	20	145.5	7	3142	3.7	
29A824	8S/24E29db1	8S	24E	29	db1	4204.3	118.9	1954	4085.4	234.2	1954				234.2	20	31	4.9	2199	0.75	
29B823	8S/23E29ad2	8S	23E	29	ad2	4243.4	188.6	1956	4054.8	250.0					250	20	126	7.2	3231	3.5	
30A724	7S/24E30db2	7S	24E	30	db2	4318.8	246.1	1954	4072.7	393.8	1954				393.8	24	11	0			
30A725	7S/25E30da1	7S	25E	30	da1	4314.1	227.0	1957	4087.1	295.9	1957				295.9	24	255	0			
30A822	8S/22E30cb1	8S	22E	30	cb1	4239.1	280.1	1956	3959.0	516.0	1956				516	20	18.5	3.7	1661	5	
30A824	8S/24E30ba1	8S	24E	30	ba1	4217.1	145.5	1955	4071.6	258.4	1955				258.4	20	22	0			
30A922	9S/22E30aa1	9S	22E	30	aa1	4186.9	238.0	1956	3948.9	360.0	1956	510	1959		510	17	339	6.9	3097	2.4	
30B724	7S/24E30bd1	7S	24E	30	bd1	4318.8	247.0	1954	4071.8	394.0	1954				394	20	12.5	3.9	1750	2	
30B824	8S/24E30db1	8S	24E	30	db1	4208.3	123.5	1954	4084.8	206.0	1954	300	1992		300	20	32	3.4	1526	1.3	
31A724	7S/24E31ac1	7S	24E	31	ac1	4305.1	234.9	1954	4070.2	363.7	1954				363.7	24	35.3	4.3	1930	2.6	
31A725	7S/25E31bd1	7S	25E	31	bd1	4271.6	186.0	1956	4085.6	222.0	1956	252	1961		252	18	220	4.2	1885	0	
31A823	8S/23E31da1	8S	23E	31	da1	4230.0	179.5	1955	4050.5	235.0	1955	243	1958		243	20	140	6.3	2827	6	
31A824	8S/24E31cd1	8S	24E	31	cd1	4243.4	158.5	1954	4084.9	212.8	1954	252.8	1954	302.8	1960	302.8	20	175	8.4	3770	11.4
31B824	8S/24E31cd2	8S	24E	31	cd2	4243.4	158.7	1954	4084.7	210.2	1954	270	1962		270	20	169	4.2	1885	5	
32A724	7S/24E32ad2	7S	24E	32	ad2	4285.4	210.8	1953	4074.7	394.8	1953				394.8	24	20	7.7	3456	5.05	
32B724	7S/24E32ad1	7S	24E	32	ad1	4285.4	210.8	1953	4074.7	250.0	1953	302	1958	397	1963	397	20	25.6	3.3	1481	2.7
32S725	7S/25E32ca1	7S	25E	32	ca1	4273.1	184.2	1956	4088.9	230.0	1956	257	1962		257	12	192	4.1	1840	1.9	
33A724	7S/24E33db1	7S	24E	33	db1	4284.0	207.2	1954	4076.8	284.0	1954	289	1957		289	20	2.5	6.1	2738	4.5	
33A725	7S/25E33bb1	7S	25E	33	bb1	4294.0	204.2	1955	4089.8	246.0	1955	301	1961		301	18	226	0			
33A824	8S/24E33bc1	8S	24E	33	bc1	4216.1	140.0	1961	4076.1	235.0					235	16	191	2.7	1212	1.8	
33A922	9S/22E33ab1	9S	22E	33	ab1	244.0	257.0								257			0			
33B724	7S/24E33db2	7S	24E	33	db2	4284.8	208.8	1956	4076.0	283.6	1956				283.6	20	31	4.3	1930	1.2	
33B922	9S/22E33ad2	9S	22E	33	ad2	4197.1	239.1	1956	3958.0	485.0	1956				485						